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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/098,524	03/18/2002	Ji Suk Hong	P67503US0	6250

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EXAMINER	
GARCIA, JOANNIE A	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 06/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/098,524	Applicant(s) HONG ET AL.	
	Examin r Joannie A García	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cov r sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

The disclosure is objected to because of the following informalities: On page 9, line 12, "fo" after "(104b of Fig. 4C)" should be replaced with --of--.

Appropriate correction is required.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, line 2, --the-- should precede "steps of:".

In claim 1, line 4, "a" before "shallow trench" should be deleted.

In claim 1, line 5, "region" after "isolation (STI)" should be replaced with --regions--.

In claim 1, line 7, "region" after "forming the STI" should be replaced with --regions--.

In claim 1, line 10, --one of-- should precede "the STI".

In claim 1, line 10, "region" after "STI" should be replaced with --regions--.

In claim 3, line 2, --the-- should precede "implanting concentration".

In claim 4, line 3, --an-- should precede "e-beam curing process".

In claim 5, line 1, "the" after "wherein" should be replaced with --an--.

In claim 6, line 2, --an-- should precede "exposure".

In claim 9, line 2, "region has" after "STI" should be replaced with --regions have--.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art, in combination with Ko et al'683 (US 2003/0003683), and Koh et al'832 (US 2002/0090832).

Applicant's admitted prior art discloses depositing a first insulating layer 11 and a second insulating layer 12/13 on a semiconductor substrate 10 where shallow trench isolation (STI) regions and a deep trench isolation (DTI) region are defined (Figure 1A), forming STI regions 15a/15b by selectively etching the second insulating layer, the first insulating layer, and the semiconductor substrate (Figure 1B), forming a photoresist 16 to cover one of the STI regions (Figure 1C), and forming DTI region 16 using photoresist 16, and the second insulating layer 12/13 as a mask (Figure 1D). Applicant's admitted prior art discloses that the first and second insulating layers include a pad oxide layer, and a pad nitride layer (Page 2, lines 15-17). Applicant's admitted prior art discloses that the STI regions 15a/15b have a depth of 2500-3000 angstroms (Page 3, lines 3-5), and that the DTI region 16 has a depth of 7000-8000 angstroms (Page 3, lines 16-18). Applicant's admitted prior art does not teach curing a surface of the photoresist by implanting argon ions at a concentration of $1 \times 10^{12\text{-}15}$ cm^3, and at an energy of 10-200 KeV, or by an e-beam curing process at an energy of 1000-2000 $\mu C/cm^2$, and exposing the photoresist to one light source among i-ray, KrF, and ArF.

Ko et al'683 discloses forming an insulating layer 118 on semiconductor substrate 122 (Figure 2), forming photoresist 116/110 covering insulating layer 118 (Figure 2), and curing photoresist with argon gas (Figure 3, and Paragraph 0032, lines 7-13), converting a portion of the photoresist to a hardened layer (Abstract). It would have been within the scope of one of ordinary skill in the art to combine the teachings of applicant's admitted prior art and Ko et al'683, to enable formation of DTI region 17 of applicant's admitted prior art, employing a cured hardened photoresist, and to obtain increased wafer throughput (Ko et al'683, Paragraph 0032, lines 18-20), increased etching selectivity, and improved profile control for photoresist materials (Ko et al'683, Abstract, lines 1-2, and 10-12).

Koh et al'832 discloses a curing process employing an argon ion implantation process at an energy of 20 KeV (Abstract, Paragraph 0027, and Paragraph 0028, lines 1-3) and an e-beam curing process (Abstract, Paragraph 0027, and Paragraph 0028, lines 3-5). Koh et al'832 discloses as well, an exposure process for photoresist 140, using either KrF and ArF exposure tools (Paragraph 0031, lines 3-6). It would have been a matter of routine optimization within the teachings of Koh et al'832 to determine a suitable concentration, and a suitable energy to achieve the argon implantation step, and the curing e-beam step. It would have been within the scope of one of ordinary skill in the art to combine the teachings of applicant's admitted prior art, Ko et al'683, and Koh et al'832, to enable formation of DTI region 17 of applicant's admitted prior art, employing a cured hardened photoresist, and to obtain increased wafer throughput (Ko et al'683, Paragraph 0032, lines 18-20), increased etching selectivity, and improved profile control for photoresist materials (Ko et al'683, Abstract, lines 1-2, and 10-12).

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956. **See MPEP 203.08**.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner J. Garcia whose telephone number is (703) 306-5733. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax number for this group is (703) 308-7722 (and 7724), and (703) 305-3431 (and 3432). MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.

JAG
6/01/03

George Fourson
Primary Examiner